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THE OHIO STATE UNIVERSITY  
RESEARCH FOUNDATION

# REPORT

By

THE OHIO STATE UNIVERSITY  
RESEARCH FOUNDATION  
COLUMBUS 10, OHIO

NAVY RESEARCH SECTION  
SCIENCE DIVISION  
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SEP 28 1949

Cooperator U.S. NAVY, OFFICE OF NAVAL RESEARCH

Contract Number N6onr-225, T.O. I

ONR Project Number NR 038 031

Investigation of VAPOR PRESSURE OF METALS AND METAL OXIDES.

Subject of Report Twelfth Quarterly Progress Report

Submitted by H.L. Johnston

Date July 1, 1949

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PROGRESS REPORT ON PROJECT RE-281

INVESTIGATION OF VAPOR PRESSURE OF METALS AND METAL OXIDES

Navy Contract Number N6onr-225, T.O.I  
ONR Project Number NR 058 031

1. Personnel.

No change in personnel on this project during the last report period.

2. Vapor Pressure of Columbium.

The experimental work in columbium is nearly completed and the data is being processed for a technical report.

3. Vapor Pressure of  $Al_2O_3$ .

About 15 runs were made with  $Al_2O_3$  in a molybdenum Knudsen cell. Flat targets and hollow spherical quartz targets (with a 2 cm. hole for the vapor to enter) have been employed to determine whether or not  $Al_2O_3$  dissociates in neighborhood of 1700 to 1900°C. The spherical quartz target was used to ascertain if the failure of the mass of the vapor evaporating from the cell to balance the mass intercepted by the target was due to thermal dissociation of the  $Al_2O_3$  into non-condensable products or whether it was due to the fact that the accommodation coefficient for the condensation of  $Al_2O_3$  on the target was not unity. The data indicates that  $Al_2O_3$  dissociates into an oxygen deficient product. Vapor pressure measurements by these methods will be abandoned for the time being. A technical report on the data so far obtained will be prepared as this material may be of use to research workers employing  $Al_2O_3$  in high temperature research.

4. Vapor Pressure of Zirconium.

A zirconium Langmuir ring was prepared by first fusing some pure zirconium in a low pressure argon arc furnace and then machining the resultant ingot into a ring. This method of fusion yields almost completely uncontaminated ingots since a water cooled copper crucible is employed and the molten metal does not wet the crucible. Utilization of a tungsten rod as an anode eliminates the possibility of contamination with the anode material.

A number of runs have been made with zirconium and the work is progressing well.

5. Vapor Pressure of Boron.

A boron carbide liner inside a graphite Knudsen cell has been made by heating boron and graphite to 2100°C.

Successful measurements of the boron vapor pressure have been made but the work is slow and tedious. A new Knudsen cell has to be made about every third run and many hours are consumed in preparing the Knudsen

cells. However, these measurements although laborious are very promising.

6. The Vapor Pressure of Chromium.

A chromium Langmuir ring has been prepared by the same method employed in the preparation of the zirconium ring. Preliminary vacuum treatment of the sample will be started.

7. The Vapor Pressure of Aluminum and Tantalum.

Work on these two materials have been deferred for the time being.

8. Technical Reports.

Technical reports are being prepared for gallium and  $B_2O_3$ . Their titles will be,

Tech. Report No. 4, "The Vapor Pressure of Inorganic Substances. II  $B_2O_3$ ".

Tech. Report No. 5, "The Vapor Pressure of Inorganic Substances. III Gallium".

NOTE: In submitting this report it is understood that all provisions of the contract between The Foundation and the Cooperator and pertaining to publicity of subject matter will be rigidly observed.

Investigator Rudolph Speiser Date JUL 1 1949

Supervisor Herwick L Johnston Date JUL 1 1949

For The Ohio State University Research Foundation

Executive Director James S. Ames Date 9/16/49  
W.R.B.